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DOMINANT GROUND MANEUVER AT THE OPERATIONAL LEVEL  
(And The Value of Speed)

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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## ABSTRACT

It is the dawn of the twenty-first century. Relentless technological forces have pulled and pulled at the fabric of the Army's operational doctrine and warfighting concepts...and it is unravelling. We seem unable to apply the miraculous advantages of information technology to the way we fight. Technology is pulling the Army apart: we need to change, but don't know how.

Joint Vision 2010 seems to point the way; the concept of "dominant maneuver" for ground forces at the operational level should emerge from these rapid advances and opportunities in technology. Often overlooked, however, is the importance of "speed," the dominant characteristic of "dominant maneuver." To be truly dominant in maneuver, our ground forces must be able to maneuver faster in all dimensions of the battlespace.

In the art of operational warfare, the picture of warfare in the next century is incomplete. The aspect of "speed" is lost or not appreciated and it is unclear how ground forces are supposed to "dominate" a concept they do not even understand.

And so, in the misty early morning of the next century, the promise of new sunshine and ideas is slowly giving way to the hot sun of reality: America's Army needs to change. But how? What's wrong with us?

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## BEGINNINGS

General George Patton said it best: "Americans love a winner."<sup>1</sup> But at the dawn of the twenty-first century, we find ourselves increasingly challenged by technological advances and how to apply them to the art of war. And although we are now light-years ahead of our nearest competitors on the field of battle and have within our reach an arsenal of weapons and forces that are the envy of the entire world, we can hear footsteps behind us; there is pressure not only to win, but to dominate.

Technology is pulling the Army apart; we don't know exactly what to do with it yet or how to fight with it. We know we need to change, but we're not sure how or why. We need a new blueprint for our fighting forces which captures the tremendous advantages of the technology business and the opportunities it offers and puts these things on the battlefield. We must become more lethal as well as be able to "do more with less." But we must also change the way we fight; our current operational concepts are no longer on solid ground.

The Chairman of the Joint Chiefs of Staff (CJCS) attempted to provide this needed direction with a document known as Joint Vision 2010 (JV 2010) in 1996. Essentially a think-piece which attempted to provide a "common direction" and conceptual framework for America's armed forces to think about the future, JV 2010 stressed the importance of "achieving dominance across the range of military operations through the application of new operational concepts...."<sup>2</sup> Four new concepts (based largely on developments in information technology) should emerge: dominant maneuver, precision engagement, full dimensional protection, and

focused logistics.' For America's ground forces at the operational level, "dominant maneuver" MUST be achieved, not only to take advantage of the rapidly evolving information technology, but to win the nation's wars.

JV 2010 and the resulting literature it inspired do not go far enough, however, toward explaining how America's ground forces can become truly "dominant" at the operational level. It is the dawn of the twenty-first century: our forces, technology, communications, weapons and ammunition will not be enough to win. The pace of the next battlefield will be too fast for the way we are now evolving. To achieve dominance on the ground, we must do more than improve our information technology and our lethality. These are only the first steps. What is important at the operational level is to take the next step: we must develop "speed." A critical aspect of maneuver at every level of war, the importance and true value of speed is often overlooked and, at the present time, no doctrine or resourcing process addresses this vital element of dominant operational maneuver.

#### **MANEUVER FUNDAMENTALS**

Maneuver is the single most important element of operational warfare and combines both movement and mobility in relation to the opponent.' Its main purpose at the operational level is to obtain a position to attack (directly or indirectly) the enemy's center of gravity, or penetrate the enemy's defenses and strike at the enemy's critical capabilities (such as logistical support or sustainment). Although there are differences in land, sea and air maneuver, each is an integral part of a major operation or campaign and is perhaps the only principle which allows decisive

victory." Achieving a position of advantage is a critical aspect of any ground maneuver. Current joint doctrine stresses maneuver and the "employment of forces on the battlefield through movement in combination with fire, or fire potential, to achieve a position of advantage..." as the key to any decisive victory. The Army's warfighting manual, FM 100-5, also highlights the

"...movement of forces in relation to the enemy to gain positional advantage. Effective maneuver... continually poses new problems for the enemy by rendering his actions ineffective, eventually leading to defeat."

It is clear that understanding maneuver is vital to the success of the operational ground commander; positional advantage over the enemy's forces and an understanding of the enemy's center of gravity are two key aspects.

Although JV 2010 coins a new phrase which attempts to capture the effects that technology will have on the principle of maneuver, "dominant maneuver" still focuses on positional advantage:

Dominant maneuver will be the multidimensional application of information, engagement, and mobility capabilities to position and employ widely dispersed joint air land sea and space forces to ...attack enemy centers of gravity ... and compel an adversary to either react from a position of disadvantage or quit."

"Dominant maneuver" will still require forces that must "apply overwhelming force" with "increasingly lethal direct and indirect fire systems, with longer ranges and more accurate targeting...." Are we on the right path to success?

#### CURRENT PROBLEMS ON THE WAY TO DOMINANT MANEUVER

At the tactical level so far, the Army's efforts to capture the advantages of information technology have proven more

difficult than anticipated. Recent experiences of the new "digitized" force at the Army's National Training Center have been rough; leaders seem overwhelmed with information (not all of it useful) rather than excited by it and incidents of fratricide are up -- worse than previous rotations (WITHOUT automation).<sup>10</sup> While Army leaders and observers insist that this is all part of the learning process, lessons learned indicate (among other things) that leaders need more training in the new concepts and new automation. The information explosion may actually weaken leadership; an unprecedented ability to "see" on the battlefield may be negated if the best view is only from above" or leaders are waiting for "perfect" information. At least for now, units are not performing (fighting) better and the technology offered is not sufficiently mature to allow any reorganization of battle staffs or changes to the way we fight. Are we off the path toward dominant maneuver? In spite of the advantages that information technology seems to offer, it appears we are not ready for them.<sup>11</sup>

The concept of dominant maneuver is also heavily dependent on the development of direct and indirect fire weapons of increased lethality and precision. This over-reliance on firepower and lethality seems to be part of our heritage. No amount of political or cultural sensitivity seems to change our preference for firepower in all of our conflicts:

Ideally, our soldiers should have been more discriminating in their use of violence, but it should come as no surprise that, under fire, they acted like the tired and scared men that they were. Violence in war us a historical given, not a variable....a casualty-conscious, conscript force like the U.S. Army...was bound to use the maximum force within reason.<sup>12</sup>

Our infatuation with technology is equalled only by our dependence on firepower. In any conflict -- past, present or future -- we will fight the only way we know how. But the American way of war may not be enough on the twenty-first century battlefield.

The linkage of maneuver with fires is both historical and practical. Operational fires are planned to force the opponent to react operationally and sometimes strategically. They can be used to facilitate friendly maneuver, or prevent or disrupt the enemy's. Fires can also be used to disrupt or isolate the area of operations or prevent reinforcement." Although the warnings are clear that operational fires must never be viewed as a decisive end," it is possible that this improved lethality and the ability to not only mass our fires but also maneuver them could actually change the concept and purpose of maneuver.

"In the past, the goal was to use firepower to allow the infantry to close with and destroy the enemy with direct combat... Now we're thinking more of using maneuver not to close with an enemy, but to bring long range fires on him. Maneuver will have more to do with staying away from the enemy than with closing with him."

Is firepower alone enough to change the concept of maneuver? This may be true if the purpose of maneuver forces is simply to gain a positional advantage in order to bring the massed effects of our weapons systems to bear on the enemy. However, this entirely misses the point of gaining positional advantage by maneuver.

Our problems with maneuver and learning how to dominate our enemies with it are rooted in our inability to understand it.

Fundamentally, we have always believed in the ability of our ground forces to bring superior fires to bear in a force-on-force battle. We are an attrition-oriented force, but this may not be wise in the information age. The smaller forces left to us by a dwindling budget may force us down another path, one where "dominant maneuver" is not an option but a necessity -- to win AND to survive. But if information technology and improved lethality will not provide all of the answers we need for maneuver dominance, what will?

#### THE THREE ASPECTS OF BEING "DOMINANT" AT MANEUVER

To become truly "dominant" in the principle of maneuver we must first recognize that the technology advances which offer us information superiority and improved lethality are only part of what must be done. Maneuver means movement; it involves crossing the battlespace between opposing sides, gaining a positional advantage, presenting a series of options to the enemy (all of which are bad), and keeping him at a disadvantage. The aim of operational maneuver, then, is to thwart the enemy at every turn and strike one of his critical centers of gravity: the will to resist or fight. In light of these things, the concept of "dominant maneuver" must really depend on three things:

- Information superiority: Gaining information superiority is the first step toward dominant maneuver and, for this reason, the vision outlined in JV 2010 is not far off the mark. Information technology and the dominance it gives our forces is important because it allows us to cross the battle space with fewer casualties. The most recent example of U.S. maneuver at the operational level occurred during Operation Desert Storm.

Reflecting back on his experiences at the tactical level during the war, General Barry McCaffrey, 24th Infantry Division Commander, observed:

"...we would have won the war if we had been using Iraqi equipment instead of our own because of the quality of our soldiers and leaders. What having better equipment ensured was fewer casualties..."

In the aftermath of the war, General McCaffrey's comments were often used to illustrate the importance of developing quality soldiers and leaders, but he was also making a point about the impact of technology on the field of battle. When the operational commander stays "connected" to his units and knows their exact locations, fratricides are reduced and more forces are available once the battle space is crossed. Situational awareness means fewer casualties. Fewer casualties means more lethality; for a smaller force this is critical. Getting there "first with the most" will still be paramount."

- Lethality: Once the battle space is crossed, we must be sufficiently lethal to do the job and destroy the enemy. The increased lethality of precision engagement weapons and the massed effects of improved (although fewer) joint weapons systems will enable us to strike enemy forces with greater effect. We MUST be more lethal since there are fewer forces left to do the job. It would be a mistake, however, to stop the analysis here and conclude that precision engagement and increased lethality will allow us to "dominate" maneuver on a future battlefield. Although improvements to indirect fire systems seem to offer promise for the operational commander, ground maneuver elements and direct fire weapons systems currently under development

appear to be proceeding at an evolutionary rather than a revolutionary pace, hardly the stuff with which to dominate.

"The Army does not yet visualize a change in the central role of the tank on the future battlefield. While recognizing the importance of UAV's, digitization, and helicopters, the need for a tank-like system remains a high priority well into the next century."<sup>10</sup>

Our concepts of maneuver for both fighting and development seem to be stuck in our past ways of fighting; force-on-force contests and attrition warfare drive us. Even the language in JV 2010 reflects our preoccupation with firepower and lethality. In spite of some new "bumper sticker" terminology, the purpose of maneuver at the operational level seems to be lost.

- Speed: The missing element on the path to maneuver dominance is speed. We have already observed that the purpose of maneuver is to gain a positional advantage over the enemy, to present him with a series of options that force him to either fight from a position of disadvantage or quit. In short, the aim of operational maneuver is to create panic in the enemy's mind where his will to resist is broken. German blitzkrieg tactics during World War II in France illustrate this:

"Victory was gained by psychological paralysis induced by movement rather than through butchery induced by massive application of firepower."<sup>10</sup>

The object of any maneuver at the operational level must relate to a center of gravity or a critical vulnerability; the purpose must be to induce psychological collapse and break the enemy's will to resist. Psychological collapse is likely to come when the enemy finds himself challenged and blocked at every turn. He will not succumb to superior technology or even

lethality; both now and in the future, he must be made to panic. Examples today of smaller, less lethal, and certainly technologically inferior nations continuing to challenge the world's superpowers are numerous. The Falklands, Grenada, Panama, Somalia, and Iraq conflicts are among many others.

"At root manoeuvre theory has nothing to do with vast numbers of men and machines charging about the countryside. Manoeuvre theory is about amplifying the force which a small mass is capable of exerting; it is synonymous with the indirect approach."<sup>21</sup>

How do we achieve this psychological collapse or break an enemy's will to resist? When the tempo or speed of operations are at such a pace that the enemy's moves are rendered irrelevant and he is presented on every side with a series of options that are all bad, we are able to induce these conditions and dominate him. Liddell Hart stressed "psychological indirectness to upset the opponent's balance and create the conditions for a decisive issue."<sup>22</sup> That is the essence of maneuver, to aim at achieving a catastrophic collapse.

Military operations therefore aim not only at dislocating his forces and resources, but also at creating a picture of defeat in the opposition's mind, rather than simply wearing him down by attrition.<sup>23</sup>

To create panic in the mind of the enemy and the appropriate level of psychological collapse necessary to dominate and break the will to resist, speed is critical -- yet often not addressed.

#### THE ELEMENTS OF SPEED: SURPRISE, TEMPO, SIMULTANEITY

The three essential elements of maneuver speed are surprise, tempo, and simultaneity.<sup>24</sup> Surprise attempts to use positional advantage or operational activities to shock the enemy and make

him fight in an unexpected direction or in a way for which he is unprepared. It attacks the enemy's mind to get inside his decision cycle. Tempo also attacks an enemy's cohesion and stability; if we can move through more "cycles" of activity than the enemy so that his current actions are no longer relevant, we have achieved tempo. Reconnaissance and intelligence as well as streamlined command and control activities aid tempo. Surprise and tempo feed each other and are complementary. The greater the tempo, the more likely the enemy will be surprised and kept unable to react. Surprise gives momentum to tempo; both are likely to "cause paralysis of the mind through a feeling of suddenness of being trapped."<sup>25</sup> Simultaneity, the last essential element of maneuver speed, seeks to take action across the depth of the enemy's forces so that it is impossible to concentrate forces.<sup>26</sup> Surprise and tempo are essential elements of maneuver at every level of warfare dating back even to ancient times; the jointness, synchronization and synergy required for simultaneity make this element uniquely applicable at the operational and strategic level of war.

There is some risk in speed for the operational commander who seeks to dominate maneuver. First, there is the risk of over-extending the maneuver force and reaching a culmination point before the mission is accomplished or the enemy reaches his.<sup>27</sup> There is also the chance that the operational maneuver will not achieve the desired, decisive result (panic and the broken will to resist) and that one's own forces are insufficient to do the job when the battle is finally joined -- being either outnumbered or less lethal. Maneuver at the operational level

which ignores the element of speed may not "...achieve victory with less force, more quickly and at less cost,"<sup>100</sup> all paradigms in the modern, resource-limited age of warfare.

Every intervention operation has an imperative for speed...The traditional response has been to achieve this either through concepts of mass, or through tactics that relied on early recourse to firepower....In the future, even the U.S. will be unable to rely on mass to overwhelm the opposition in all but special circumstances. ...emphasis on tempo and surprise aims to maximise the potential of what will inevitably be light and perhaps smaller forces deployed on these operations in the future."<sup>101</sup>

#### **FREEDOM FROM LOGISTICS AND GETTING OFF THE GROUND: THE SOLUTION TO SPEED AT THE OPERATIONAL LEVEL**

Our operational thought and analysis as well as our modernization efforts are limited to our past experiences. The effects of our tactical weapons systems and the possibilities of the new information technology are still focused on traditional land warfare. When we speak of maneuver, we seldom consider that the enemy can move, too. Speed of maneuver, however, will be "the essential ingredient of an information age army" and a "future landpower force."<sup>102</sup> We need the ability to keep an opponent static or fixed without the aid of superior fires or numbers at the operational level; speed is the answer. How do we get faster?

One often-ignored method for improving speed at the operational level of war is to break free of our logistical chains:

"Speed will be achieved by creating a force unburdened by the logistical yoke that has long been an impediment to agility and speed."<sup>103</sup>

During the American Civil War, General U.S. Grant could not gain speed or tempo at the operational level to fix and finally defeat Lee's Army of Northern Virginia, one of the South's centers of gravity, until he broke free of his logistical tail. Later, using the Army of the Potomac to fix Lee's forces and Sherman's forces in the west to maneuver rapidly through the Confederate southern states (unfettered by the large, resource-consuming logistical tail which bogged down his predecessors), Grant's speed of operational movement eventually paralyzed his opponent. Lee was faced with only bad choices in the end and was forced to surrender his army rather than continue. The surrender at Appomattox is a story of speed of maneuver at the operational level, not of the butchery of an attrition battle so common earlier in the war. Grant's speed was made possible by his logistical freedom.

The secret of the German Wehrmacht in World War II and the success of the blitzkrieg forces in France is also a story of logistical freedom.<sup>22</sup> Able to break free of the railhead just long enough to reach into the enemy rear with enough strength to break his will and create a psychological collapse, German blitzkrieg forces were able to hold long enough for the slower, follow-on forces to exploit.<sup>23</sup> However, it does not always work. Failure in Russia came when they could no longer sustain this logistical freedom (due to the vastness of the Russian empire) and when the exploitation forces could not keep up with the Panzers.

"If tomorrow's generals have to ask  
'if it can be done' it may be too late."<sup>24</sup>

Unchained from logistics, ground forces would revolutionize the nature of warfare. If able to deploy anywhere in the world in a matter of hours or days, then move on the battlefield unfettered by refueling requirements and cumbersome support tails at alarming rates of speed, we would be well on the way to maneuver domination.

The pace of the future battlefield will be frenetic; engagements will be fought non-stop, around the clock, and in all types of weather.<sup>35</sup> Ground forces must be able to rapidly maneuver under all conditions, but these capabilities cannot be limited to the capability of vehicles.

"No doubt marginal improvements will continue to be made in the speed and cross country performance of wheeled and tracked vehicles, but the real advantage will lie with the force that can fight its battles not on the ground but a few feet above it."<sup>36</sup>

Our infantry soldiers are still on the ground, however, and cannot carry all the weight of the information technology that is supposed to help them cross the battle space. There is no plan to change the Army's tank through the year 2020 either; it also still moves on the ground and the weight alone makes it difficult to move by our most rapid means of transportation -- air.<sup>37</sup> Sealift for ground forces is not the highest priority for the Navy; Army forces have not been moved closer to ports in the latest round of base realignments. The nation's only helicopter-equipped division (the 101st Air Assault Division at Ft Campbell, Kentucky) is one of the most demanded and deployed units in the Army, and yet there are no plans to expand this critical maneuver force. Ground forces must get off the ground! The demand for helicopters in the future will be "insatiable:"

"By eliminating the friction of the ground, tempo will increase to a revolutionary degree. The pace of battle for evenly matched enemies will be ferocious; for the enemy still equipped for the industrial age, the contest will be brief and crushing."<sup>88</sup>

#### CONCLUSION: WE MUST GET FASTER!

Speed will be "the essential finishing function" for ground forces of the future and the most critical aspect of maneuver dominance. Freedom from logistical constraints and from the friction of the ground itself will allow us to achieve it. Information technology alone and the opportunities it offers -- increased situational awareness, streamlined command and control, and perhaps even new operational concepts -- is not enough for us to dominate ground maneuver at the operational level. It reduces casualties and improves tempo, but there are risks: we haven't figured out how to assimilate and fight with the information yet.

Improved lethality will not be enough to dominate the battlefield either. Our weapons and systems will always improve at an evolutionary pace and battles will still be won by fire and by movement. Firepower and increased lethality create opportunities for maneuver, but precision fires and their massed effects will never be decisive or the key to achieving dominant maneuver. Again, we risk a myopic view of maneuver and an over-dependence on our weapons systems; they will not be enough on a future battlefield.

Maneuver must always focus on the enemy center of gravity and the ability of his operational forces to resist attack. The enemy's will to fight must be broken and psychological collapse induced by the violence and tempo of overwhelming speed at the operational level. Information superiority and increased

lethality are only the first steps we must take; the next, most important step toward dominance at maneuver -- our best and brightest hope for success -- is to increase our speed. But we can't hope to succeed at the current pace of our ground forces (twenty kilometers per hour!) -- we must move at ten times that speed. Ground forces must be able to deploy to a theater of operations in such dominating fashion and, once there, move with such alarming speed that no one dares to challenge us. The warrior has not come along yet who has taken full advantage of the opportunities offered in the information age and put them in synergistic fashion on the battlefield at the operational level." We must break our logistical chains and we must get off the ground; only then will we be truly dominant. Opportunity urges us on! We must change -- we must get faster!

## NOTES

1. General George S. Patton, "Speech to U.S. Third Army," quoted in Colonel Herbert J. Lloyd, USA (RET), The Reasons Why. (U.S. Army War College: Calisile Barracks, PA, 1992), p.155.
2. Joint Chiefs of Staff, Joint Vision 2010 (Washington D.C.: July 1996), p.1.
3. Ibid.
4. Milan Vego, On Operational Art, 2d Draft (Newport R.I.: U.S. Naval War College, March 1998), p.130.
5. Vego, pp.130,136.
6. Joint Warfighting Center, Concept for Future Joint Operations: Expanding Joint Vision 2010 (Fort Monroe, VA: May 1997), p.49.
7. Department of the Army, FM 100-5 Operations (Washington D.C.: June 1993), p.2-5.
8. JV 2010, 20.
9. Ibid., pp.20-21.
10. George C. Wilson, "Army Leaders 'Surprised' by Number of Friendly Fire Killings," Army Times, October 13, 1997, p.3.
11. Captain Robert L. Bateman, "Force XXI and the Death of Auftragstaktik (Executing Mission Orders)," Armor Magazine, January-February 1996, Vol 105, No.1, pp.13-15.
12. Jason Sherman, "Rush to Digitization (Has the Electronic Battlefield Been Oversold?)," Armed Forces Journal International, February 1996, pp.40-42.
13. Eric M. Bergerud, The Dynamics of Defeat (Boulder Colorado: Westview Press, 1991), pp.5,334.
14. Captain Chet Helms, Operational Functions, NWC 4103A (Newport R.I.: U.S. Naval War College, 1998), p.13.
15. LTC Robert W. Madden, "The Myth of Destruction: Artillery in the Great War," Field Artillery, August 1994, p.46.
16. General Charles Krulak, USMC, quoted in Jim Blaker, "The Owens Legacy," Armed Forces Journal International, July 1996, p.21.
17. General Barry R. McCaffrey quoted in Patricia Slayden Hollis, "Artillery - the Most Important Factor on the Battlefield," Field Artillery, February 1994, p.5.
18. Nathan Bedford Forrest in Lloyd, The Reasons Why, p.198.

19. Army Science Board quoted in Colonel David M. Cowan, "Armor Modernization," Armor Magazine, May-June 1997, p.10.

20. Major General Robert H. Scales, Jr., "Cycles of War," Armed Forces Journal International, July 1997, p.40.

21. Richard Simpkin quoted in J.J.A. Wallace, "Manoeuvre Theory in Operations Other Than War," The Journal of Strategic Studies, Vol 19, No.4, December 1996, p.208.

22. Liddell Hart quoted in Wallace, p.208.

23. Ibid.

24. Wallace, p.209.

25. Ibid.

26. Ibid.

27. Ibid.

28. Ibid., p.224.

29. Ibid.

30. Scales, pp.38,41.

31. Ibid., p.40.

32. Ibid., p.41.

33. Ibid.

34. Alistair Irwin, "The Buffalo Thorn: The Nature of the Future Battlefield," The Journal of Strategic Studies, Vol 19, No.4, December 1996, p.247.

35. Ibid., pp.236-237.

36. Ibid., p.244.

37. Cowan, p.10.

38. Irwin, p.245.

39. Scales, p.42. General Scales also makes an interesting case for the similarities between the dawn of the industrial age and the current dawning of the information age. German General Heinz Guderian was finally able to apply Henry Ford's work on the automobile to the battlefield and the German Panzer Division concept after years of study and contemplation. Battlefield application of today's information technology, offered by Bill Gates and Microsoft, may also take some time.

## BIBLIOGRAPHY

- Bateman, Captain Robert L. "Force XXI and the Death of Auftragstaktik (Executing Mission Orders)." Armor Magazine, January-February 1996, Volume 105, No.1, pp.13-15.
- Bergerud, Eric M. The Dynamics of Defeat. Boulder, Colorado: Westview Press, 1991.
- Blaker, Jim. "The Owens Legacy." Armed Forces Journal International, July 1996, p.20-22.
- Blazar, Ernest. "Inside The Ring: Sacred Cows." Washington Times, April 16, 1998, p.10.
- Boice, Major General William M. and Colonel Christopher C. Shoemaker. "Fire and Maneuver: The End of Splendid Isolation." Field Artillery, February 1994, pp.8-11.
- Catton, Bruce. A Stillness At Appomattox. New York: Simon and Schuster, 1972.
- Clausewitz, Carl Von. On War. Michael Howard and Peter Paret, ed. Princeton N.J.: Princeton University Press, 1976.
- Cowan, Colonel David M. "Armor Modernization." Armor Magazine, May-June 1997, pp.9-10.
- Helms, Captain Chet. Operational Functions, NWC 4103A. Newport R.I., U.S. Naval War College, 1998.
- Hollis, Patricia Slayden. "Artillery - the Most Important Factor on the Battlefield." Field Artillery, February 1994, pp.4-7.
- Hughes, Major Stephen E. "Desert Storm: Attrition or Maneuver?" Unpublished Research Paper, School of Advanced Military Studies, United States Army Command and General Staff College, Fort Leavenworth, Kansas, 1995.
- Irwin, Alistair. "The Buffalo Thorn: The Nature of the Future Battlefield." The Journal of Strategic Studies, Volume 19, No.4, December 1996, pp.227-250.
- Joint Military Operations Department. Elements of Operational Warfare, NWC 4096A. Newport R.I.: U.S. Naval War College, August 1997.
- Kimminau, Major Jon A. "Joint Vision 2010: Hale or Hollow?" U.S. Naval Institute Proceedings, September 1997, 78-81.
- Leonhard, Robert R. The Art of Maneuver. Novato, CA: Presidio Press, 1991.

- Lind, William. Maneuver Warfare Handbook. Boulder, Colorado: Westview Press, 1985.
- Lloyd, Colonel Herbert J., USA(RET). The Reasons Why. Carlisle Barracks, PA: U.S. Army War College, 1992.
- Madden, Lieutenant Colonel Robert W. "The Myth of Destruction: Artillery in the Great War." Field Artillery, August 1994, pp.44-47.
- Parish, Peter J. The American Civil War. New York: Holmes and Meier, 1975.
- Scales, Major General Robert H., Jr. "Cycles of War." Armed Forces Journal International, July 1997, pp.38-42.
- Sherman, Jason. "Rush to Digitization (Has the Electronic Battlefield been Oversold?)" Armed Forces Journal International, February 1996, pp.40-42.
- Starry, Colonel Michael and Major Kevin LaMar. "It's not the Same Old Army." Armed Forces Journal International, October 1995, pp.38-42.
- Towell, Pat. "Strain is Showing as Military Tries To Do More With Less." Congressional Quarterly Weekly Report, April 25, 1998, pp.26-27.
- U.S. Department of the Army. FM 100-5, Operations. Washington, D.C., June 1993.
- U.S. Joint Chiefs of Staff. Joint Vision 2010. Washington, D.C., July 1996.
- U.S. Joint Warfighting Center. Concept for Future Joint Operations: Expanding Joint Vision 2010. Fort Monroe, VA, May 1997.
- Vego, Milan. On Operational Art, 2d Draft. Newport R.I., U.S. Naval War College, March 1998.
- Wallace, J.J.A. "Manoeuvre Theory in Operations Other Than War." The Journal of Strategic Studies, Volume 19, No.4, December 1996, pp.207-226.
- Wells, Lieutenant Colonel Billy E., Jr. "The Future of Infantry: Maneuver in the Twenty-First Century." Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA, 1997.
- Wilson, George C. "Army Leaders 'Surprised' by Number of Friendly Fire Killings." Army Times, October 13, 1997, p.3.